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ABSTRACT

Consistent with the present invention, tissue adhesive compositions and an associated laser exposure system are provided for bonding or sealing biological tissues. The compositions are comprised of chemically derivatized soluble collagen which is formulated to concentrations ranging from 300 mg/ml (30%) to 800mg/ml (80%) collagen protein. In particular, Type I collagen, for example, is first prepared by extraction from bovine or porcine hide and purified. The collagen preparations are then chemically derivatized with sulfhydryl reagents to improve cohesive strength and with secondary derivatizing agents, such as carboxyl groups, to improve the adhesive strength of the solder to the tissue. The compositions are then formed into viscous solutions, gels or solid films which are used to encapsulate structural components such as a cojoinal network or mesh. The resultant patch which when exposed to energy generated from an infrared laser, for example, undergo thermally induced phase transitions. Solid or semi-solid protein compositions become less viscous enabling the high concentration protein to penetrate the interstices of treated biological tissue or to fill voids in tissue. As thermal energy is released into the surrounding environment, the protein compositions again become solid or semi-solid, adhering to the treated tissue or tissue space and are reinforced by the embedded cojoinal network or mesh.